

## ARACHNIDS

### **Spruce-fir moss spider**

USFWS optimal survey window: May-August

Habitat Description: This species is known only from spruce-fir forests in the Appalachian mountains of North Carolina and Tennessee. The spruce-fir moss spider occurs in well-drained moss and liverwort mats growing on rocks or boulders. These mats are found in well-shaded areas in mature, high elevation ( $\geq 1524.0$  m/5000.0 ft) Fraser fir and red spruce forests. The spruce-fir moss spider is very sensitive to desiccation and requires environments of high and constant humidity. The need for humidity relates to the moss mats, which cannot become too parched or else the mats become dry and loose. Likewise, the moss mats cannot be too wet because large drops of water can also pose a threat to the spider. The spider constructs its tube-shaped webs in the interface between the moss mat and the rock surface. Some webs have been found to extend into the interior of the moss mat.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Spruce-fir Moss Spider in North Carolina. <http://www.fws.gov/nc-es/spider/sprummoss.html>. (Accessed 02/18/08)

## BIRDS

### **Piping plover**

USFWS optimal survey window: year round

Habitat Description: The piping plover breeds along the entire eastern coast of the United States. North Carolina is uniquely positioned in the species' range, being the only State where the piping plover's breeding and wintering ranges overlap and the birds are present year-round. They nest most commonly where there is little or no vegetation, but some may nest in stands of beachgrass. The nest is a shallow depression in the sand that is usually lined with shell fragments and light-colored pebbles.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/15/08)

[USFWS] United States Fish and Wildlife Service. Piping plover (*Charadrius melodus*) <http://www.fws.gov/nc-es/birds/pipiplov.html>. (Accessed 02/15/08)

**Red-cockaded woodpecker**

USFWS optimal survey window: year round; November-early March (optimal)

Habitat Description: The red-cockaded woodpecker (RCW) typically occupies open, mature stands of southern pines, particularly longleaf pine (*Pinus palustris*), for foraging and nesting/roosting habitat. The RCW excavates cavities for nesting and roosting in living pine trees, aged 60 years or older, and which are contiguous with pine stands at least 30 years of age to provide foraging habitat. The foraging range of the RCW is normally no more than 0.5 miles.

Biological Conclusion:

[USFWS] United States Fish and Wildlife Service. Red-cockaded Woodpecker in North Carolina. <http://www.fws.gov/nc-es/birds/rcwood.html>. (Accessed 02/18/08)

**Roseate tern**

USFWS optimal survey window: June-August

Habitat Description: In North Carolina, the roseate tern is most likely to be seen on barrier islands as it passes through the area to and from northern breeding grounds. March through May and August through October are the most likely times to see these birds. Although sight records of this species exist for June, July, and August, these are likely non-breeding males. Only one nesting record for this species has been documented for the state within the past twenty years. However, if this species expands its range it is likely to choose coastal areas of the state for nesting. The roseate tern nests on isolated, less disturbed coastal islands in areas characterized by sandy, rocky, or clayey substrates with either sparse or thick vegetation. Eggs are usually laid such that grasses or overhanging objects provide shelter. They may also nest in marshes, but it is an uncommon occurrence.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Roseate terns in North Carolina. <http://www.fws.gov/nc-es/birds/rosetern.html>. (Accessed 02/18/08)

**Wood stork**

USFWS optimal survey window: June-September

Habitat Description: Wood storks are not known to breed in North Carolina. However, they may be observed in North Carolina's coastal areas after nesting has concluded in more southerly states, primarily from June to September. Wood storks typically construct their nests in medium to tall trees that occur in stands located either in swamps or on islands surrounded by relatively broad expanses of open water. In many areas, bald cypress and red mangrove trees are preferred.

During the nonbreeding season or while foraging, wood storks occur in a wide variety of wetland habitats, including freshwater marshes and stock ponds, shallow, seasonally flooded roadside or agricultural ditches, narrow tidal creeks or shallow tidal pools, managed impoundments, and depressions in cypress heads and swamp sloughs. Because of their specialized feeding behavior, the most attractive feeding areas are swamp or marsh depressions where fish become concentrated during dry periods.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/15/08)

[USFWS] United States Fish and Wildlife Service. Wood stork in North Carolina. <http://www.fws.gov/nc-es/birds/woodstor.html>. (Accessed 02/15/08)

## **FISH**

### **Cape Fear shiner**

USFWS optimal survey window: April-June (tributaries); year round (large rivers)

Habitat Description: The Cape Fear shiner is known only from the Cape Fear River watershed. In general, habitat occurs in streams with clean gravel, cobble, or boulder substrates. It is most often observed inhabiting slow pools, riffles, and slow runs associated with water willow (*Justicia americana*) beds, which it uses for cover. Juveniles can be found inhabiting slackwater, among large rock outcrops and in flooded side channels and pools. Spawning occurs May through June, when water temperatures reach 66 degrees Fahrenheit.

Biological Conclusion:

[NCNHP] North Carolina Natural Heritage Program. Cape Fear shiner (*Notropis mekistocholas*). <http://www.ncnhp.org/Images/45.pdf>.

[NCWRC] North Carolina Wildlife Resources Commission. Cape Fear shiner (*Notropis mekistocholas*). [http://www.ncwildlife.org/pg07\\_WildlifeSpeciesCon/pg7b1b1\\_1.htm](http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/pg7b1b1_1.htm). (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Cape Fear Shiner. [http://www.fws.gov/nc-es/fish/CFS\\_Fact\\_Sheet1.pdf](http://www.fws.gov/nc-es/fish/CFS_Fact_Sheet1.pdf). (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Cape Fear shiner (*Notropis mekistocholas*). <http://www.fws.gov/nc-es/fish/cfshiner.html>. (Accessed 02/18/08)

### **Roanoke logperch**

USFWS optimal survey window: year round; April – June (optimal)

Habitat Description: In North Carolina, the logperch is known from the upper Roanoke River basin. The fish typically inhabits warm, usually clear, small to medium-sized rivers. These waterways have a moderate to low gradient, and the fish usually inhabit riffles and runs, with silt-free sandy to boulder-strewn bottoms. Young are usually found in slow runs and pools with clean sandy bottoms. In winter, logperch may be more tolerant of silty substrates, and may also inhabit pools. Spawning occurs in April or May in deep runs over gravel and small cobble. Males are associated with shallow riffles during the reproductive period; females are common in deep runs over gravel and small cobble, where they spawn.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/12/08)

[USFWS] United States Fish and Wildlife Service. Roanoke Logperch (*Percina rex*) [http://www.fws.gov/northeast/virginiafield/PDFS/EndSpecies/Fact\\_Sheets/roanoke%20logperch.pdf](http://www.fws.gov/northeast/virginiafield/PDFS/EndSpecies/Fact_Sheets/roanoke%20logperch.pdf).

[USFWS] United States Fish and Wildlife Service. 1991. Roanoke logperch (PERCINA REX) recovery plan. Agency draft. U.S. Fish and Wildl. Serv., Newton Corner, Massachusetts. 31 pp.

### **Shortnose sturgeon**

USFWS optimal survey window: surveys not required; assume presence in appropriate waters

Habitat Description: Shortnose sturgeon occur in most major river systems along the eastern seaboard of the United States. The species prefers the nearshore marine, estuarine, and riverine habitat of large river systems. It is an anadromous species that migrates to faster-moving freshwater areas to spawn in the spring, but spends most of its life within close proximity of the river's mouth. Large freshwater rivers that are unobstructed by dams or pollutants are imperative to successful reproduction. Distribution information by river/waterbody is lacking for the rivers of North Carolina; however, records are known from most coastal counties.

Biological Conclusion:

[NMFS] National Marine Fisheries Service. 1998. Recovery Plan for the Shortnose Sturgeon (*Acipenser brevirostrum*). Prepared by the Shortnose Sturgeon Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 104 pages.

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources. Shortnose sturgeon (*Acipenser brevirostrum*) <http://www.nmfs.noaa.gov/pr/species/fish/shortnosesturgeon.htm>. (Accessed 02/15/08)

[USFWS] United States Fish and Wildlife Service. Shortnose sturgeon in North Carolina. <http://www.fws.gov/nc-es/fish/shortst.html>. (Accessed 02/15/08)

**Spotfin chub (= turquoise shiner)**

USFWS optimal survey window: September – November (tributaries) year round (large rivers)

Habitat Description: The spotfin chub occurs in the Little Tennessee River drainage system. This minnow typically inhabits moderate to large streams, 49-230 feet in width. However, they have been documented utilizing smaller tributaries in the fall. These streams should have a good current, clear water, cool to warm temperatures, and pools alternating with riffles. Specimens of spotfin chub have been taken from a variety of substrates but rarely from significantly silted substrates. This species has been observed spawning under loose rocks over bedrock.

Biological Conclusion:

[NCWRC] North Carolina Wildlife Resources Commission. Spotfin Chub (*Cyprinella monacha*). [http://www.ncwildlife.org/pg07\\_WildlifeSpeciesCon/pg7b1b1\\_2.htm](http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/pg7b1b1_2.htm). (Accessed 02/15/08)

[USFWS] United States Fish and Wildlife Service. Spotfin Chub in North Carolina. <http://www.fws.gov/nc-es/fish/spotfinch.html>. (Accessed 02/15/08)

**Waccamaw silverside (= skipjack or glass minnow)**

USFWS optimal survey window: year round

Habitat Description: The Waccamaw silverside is found only in the Waccamaw River watershed. The required habitat for the Waccamaw silverside to survive is high quality, neutral pH water with a clean sandy substrate. Waccamaw silversides inhabit the surface over shallow, dark bottomed areas. Spawning occurs in April through June and peaks when water temperatures reach 68-72 degrees Fahrenheit.

Biological Conclusion:

[NCWRC] North Carolina Wildlife Resources Commission. Waccamaw Silverside (*Menidia extensa*). [http://www.ncwildlife.org/pg07\\_WildlifeSpeciesCon/pg7b1b1\\_3.htm](http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/pg7b1b1_3.htm). (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Waccamaw Silverside in North Carolina. <http://www.fws.gov/nc-es/fish/waccsilver.html>. (Accessed 02/18/08)

**INSECTS**

### **Saint Francis' satyr**

USFWS optimal survey window: May 5-June 6 and July 26 to August 21

Habitat Description: The Saint Francis' satyr butterfly is only known from the Sandhills of North Carolina, although its historic range may have been much larger. This butterfly is known to inhabit wide, wet meadows dominated by sedges and other wetland graminoids. These wetlands are often relicts of beaver activity and are boggy areas that are acidic and ephemeral. These sites must be continually maintained to persist as open areas. The larval host of the Saint Francis' satyr is thought to be grasses, sedges and rushes.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Saint Francis Satyr in North Carolina. <http://www.fws.gov/nc-es/insect/stfrancis.html> (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. 1996. Saint Francis' Satyr Recovery Plan. Atlanta, GA. 27 pp.

[DOA] Department of the Army, Endangered Species Branch. 2007. St. Francis' Satyr Monitoring and Studies. <http://www.bragg.army.mil/esb/satyr.htm>. (Accessed 02/18/08).

## **MAMMALS**

### **Carolina Northern flying squirrel**

USFWS optimal survey window: May -October; coldest days in coldest winter months (nest box surveys)

Habitat Description: There are several isolated populations of the Carolina Northern flying squirrel in the mountains of North Carolina. This nocturnal squirrel prefers the ecotone between coniferous (red spruce, Fraser fir, or hemlock) and mature northern hardwood forests (beech, yellow birch, maple, hemlock, red oak, and buckeye), typically at elevations above 4,500 feet. In some instances, the squirrels may be found on narrow, north-facing valleys above 4000 feet. Both forest types are used to search for food and the hardwood forest is used for nesting sites. Mature forests with a thick evergreen understory and numerous snags are most preferable. In winter, squirrels inhabit tree cavities in older hardwoods, particularly yellow birch.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/18/08)

[NCWRC] North Carolina Wildlife Resources Commission. 2005. Northern Flying Squirrel Fact Sheet.  
[http://www.ncwildlife.org/pg07\\_WildlifeSpeciesCon/nongame\\_noflysquirrel\\_lores.pdf](http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/nongame_noflysquirrel_lores.pdf).  
(Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Carolina northern flying squirrel.  
<http://www.fws.gov/nc-es/mammal/cnflyings.html>. (Accessed 02/18/08)

### **Eastern cougar**

USFWS optimal survey window: year round

Habitat Description: Records of eastern cougar occur across the state of North Carolina with most sightings in coastal swamps and the southern Appalachian Mountains. This nocturnal predator is found in large remote wilderness areas where there is an abundance of their primary food source, whitetailed deer. A cougar will usually occupy a range of 10 to 20 square miles, varying in size with age, sex, and food availability.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available  
<http://www.natureserve.org/explorer>. (Accessed 02/18/08)

[NCNHP] North Carolina Natural Heritage Program. Eastern cougar.  
<http://www.ncnhp.org/Images/9.pdf>. (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Eastern Cougar (*Puma concolor couguar*). <http://www.fws.gov/nc-es/mammal/cougar.html>. (Accessed 02/18/08)

### **Gray bat**

USFWS optimal survey window: May-15 through August 15; January 15-February 15 (winter)

Habitat Description: Gray bats are known mainly from the cave regions of the southeast and midwest. They live in colonies in caves, utilizing different caves for summer roosting and winter hibernating. Summer caves are usually within one half mile of a river or reservoir, which provides foraging habitat. During the summer, females give birth and rear the young in maternity caves, while males and yearlings roost in separate bachelor caves. Caves preferred for hibernation are typically deep, vertical caves with a temperature between 6 and 11 degrees Celsius. Gray bats are highly selective in choosing suitable caves, and nine known caves are thought to provide hibernation space for 95% of the population. Migration from summer to winter caves begins in September and is mainly complete by the beginning of November.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Gray Bat in North Carolina. <http://www.fws.gov/nc-es/mammal/graybat.html>. (Accessed 02/18/08)

### **Indiana bat**

USFWS optimal survey window: May-15 through August 15; January 15-February 15 (winter)

Habitat Description: The range of the Indiana bat centers on cavernous limestone regions in the eastern United States. The Indiana bat has different summer and winter habitat requirements. Winter habitat is in caves and abandoned mines that usually have standing water on the floor. The bats migrate to the winter habitat between September and November; they stay there with occasional periods of activity until they emerge in mid-March to early May. Hibernation only occurs in regions where winter temperatures are stable and are around 40 degrees Fahrenheit. Little is known of the summer habitat of the Indiana bat, it is thought that they disperse throughout their range and spend the summer foraging alone over streams or along forest margins. They have been found under loose bark on dead and living trees along small to medium-sized streams. Optimum foraging is over streams with mature riparian vegetation overhanging the water by more than nine feet. Streams that have been stripped of their riparian vegetation do not appear to offer suitable foraging habitat. Rivers as foraging areas and as migration routes are extremely important to this species.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. 2005. The Indiana Bat in Western North Carolina: A Status Summary Update-April 2005. <http://www.fws.gov/nc-es/mammal/Aprilbat.pdf>. (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Indiana bat in North Carolina. <http://www.fws.gov/nc-es/mammal/indianabat.html>. (Accessed 02/18/08)

### **Red wolf**

USFWS optimal survey window: year round;

Habitat Description: Red wolves were extirpated from North Carolina and most other southeastern states by the 1920's. In the mid 1980's, the United States Fish and Wildlife Service reintroduced the species to the Alligator National Wildlife Refuge in eastern North Carolina. Since that time, the wolves have expanded

their range outside the refuge. Red wolves are generally crepuscular predators, preying on deer, nutria, raccoon, rabbits, and other small mammals. Any area that provides sufficient size, adequate food, water, and the basic cover requirement of heavy vegetation, should be suitable habitat for the red wolf. Telemetry studies indicate that red wolf home range requirements vary from about 25 to 50 square miles.

**Biological Conclusion:**

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Red wolves in North Carolina. <http://www.fws.gov/nc-es/mammal/redwolf.html>. (Accessed 02/18/08)

**Virginia big-eared bat**

USFWS optimal survey window: May-15 through August 15; January 15-February 15 (winter)

Habitat Description: Virginia big-eared bat has been recorded in the Appalachian mountains of North Carolina. They occupy caves in the summer and winter. Hibernating colonies are typically located in deep cave passageways that have stable temperatures and air movement, the temperature in these hibernacula may be lower than that tolerated by other bats. Roost sites are generally located in mines or caves in oak-hickory forests. They will use alternate roost sites but there is no record of long migrations. They are nocturnal and leave their roost to forage on moths, beetles, and other insects. This species feeds mostly over open pasture, corn and alfalfa fields, and around the crowns of trees.

**Biological Conclusion:**

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Virginia big-eared bats in North Carolina. <http://www.fws.gov/nc-es/mammal/vbigear.html>. (Accessed 02/18/08)

**West Indian manatee**

USFWS optimal survey window: year round

Habitat Description: Manatees have been observed in all the North Carolina coastal counties. Manatees are found in canals, sluggish rivers, estuarine habitats, salt water bays, and as far off shore as 3.7 miles. They utilize freshwater and marine habitats at shallow depths of 5 to 20 feet. In the winter, between October and April, manatees concentrate in areas with warm water. During other times of the year habitats appropriate for the manatee are those with sufficient water depth, an adequate food supply, and in proximity to freshwater. Manatees require a source

of freshwater to drink. Manatees are primarily herbivorous, feeding on any aquatic vegetation present, but they may occasionally feed on fish.

**Biological Conclusion:**

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/18/08)

[NCRWC] North Carolina Wildlife Resources Commission. Wildlife Profiles: West Indian Manatee (*Trichechus manatus*). [http://www.ncwildlife.org/pg07\\_WildlifeSpeciesCon/Profiles/manateewindian.pdf](http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/Profiles/manateewindian.pdf). (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. West Indian Manatees in North Carolina. <http://www.fws.gov/nc-es/mammal/manatee.html>. (Accessed 02/18/08)

## **MUSSELS**

### **Appalachian elktoe**

USFWS optimal survey window: year round

Habitat Description: The Appalachian elktoe is known from the French Broad River watershed in North Carolina. The Appalachian elktoe has been observed in moderate- to fast-flowing water, in gravelly substrates often mixed with cobble and boulders, in cracks of bedrock and in relatively silt-free, coarse, sandy substrates. Apparently, stability of the substrate is critical to this species, as it is seldom found in stream reaches with accumulations of silt or shifting sand, gravel, or cobble.

**Biological Conclusion:**

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/14/08)

[NCWRC] North Carolina Wildlife Resources Commission. North Carolina Mussel Atlas: [http://www.ncwildlife.org/pg07\\_WildlifeSpeciesCon/pg7b1a1.htm](http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/pg7b1a1.htm) (Accessed 02/14/08)

### **Carolina heelsplitter**

USFWS optimal survey window: year round

Habitat Description: The Carolina heelsplitter was historically known from several locations within the Catawba and Pee Dee River systems in North Carolina and the Pee Dee and Savannah River systems, and possibly the Saluda River system, in South Carolina. In North Carolina, the species is now known only from a handful of streams in the Rocky and Catawba River systems. The species exists

in very low abundances, usually within 6 feet of shorelines, throughout its known range. The general habitat requirements for the Carolina heelsplitter are shaded areas in large rivers to small streams, often burrowed into clay banks between the root systems of trees, or in runs along steep banks with moderate current. The more recent habitat where the Carolina heelsplitter has been found is in sections of streams containing bedrock with perpendicular crevices filled with sand and gravel, and with wide riparian buffers.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/14/08)

[NCWRC] North Carolina Wildlife Resources Commission. North Carolina Mussel Atlas: [http://www.ncwildlife.org/pg07\\_WildlifeSpeciesCon/pg7b1a1.htm](http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/pg7b1a1.htm). (Accessed 02/14/08)

[USFWS] United States Fish and Wildlife Service. Carolina heelsplitter in North Carolina. <http://www.fws.gov/nc-es/mussel/carolheel.html>. (Accessed 02/14/08)

### **Cumberland bean**

USFWS optimal survey window: year round

Habitat Description: Historically, the Cumberland bean was known from ten river systems in the Cumberland and Tennessee River basins in Alabama, Georgia, Kentucky, Tennessee, and Virginia. The Cumberland bean currently survives in only three of those systems. A relatively strong population exists in a short reach of the Hiwassee River downstream of the North Carolina/Tennessee State line in Polk County, Tennessee. Although no specimens have been collected in North Carolina, it is likely that the species occurs in small numbers in the North Carolina portion of the in the Hiwassee River, where the habitat appears suitable below the Appalachia Dam, Cherokee County. The Cumberland bean typically inhabits medium-sized streams to small rivers (5-20m width). It is found in silt-free sand, gravel, and cobble substrates in waters with moderate to fast currents and depths less 3 feet. It frequently occurs in the transition zone between gravel and sand substrates.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/18/08).

[NCWRC] North Carolina Wildlife Resources Commission. North Carolina Mussel Atlas: [http://www.ncwildlife.org/pg07\\_WildlifeSpeciesCon/pg7b1a1.htm](http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/pg7b1a1.htm) (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Cumberland Bean Pearlymussel (*Villosa trabalis*): [http://ecos.fws.gov/docs/life\\_histories/F000.html](http://ecos.fws.gov/docs/life_histories/F000.html) (Accessed 02/18/08)

### **Dwarf wedgemussel**

USFWS optimal survey window: year round

Habitat Description: In North Carolina, the dwarf wedgemussel is known from the Neuse and Tar River drainages. The mussel inhabits creek and river areas with a slow to moderate current and sand, gravel, or firm silt bottoms. Water in these areas must be well oxygenated. Stream banks in these areas are generally stable with extensive root systems holding soils in place.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/12/08)

[NCWRC] North Carolina Wildlife Resources Commission. North Carolina Mussel Atlas: [http://www.ncwildlife.org/pg07\\_WildlifeSpeciesCon/pg7b1a1.htm](http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/pg7b1a1.htm) (Accessed 02/12/08)

### **James spinymussel**

USFWS optimal survey window: year round; April-June (optimal)

Habitat Description: The James spinymussel was once found throughout the main stem of the James River and all of its major tributaries upstream of Richmond VA. The species has experienced a precipitous decline over the past two decades and now exists only in small, headwater tributaries of the upper James River basin in Virginia and West Virginia and the upper Roanoke River drainage of Virginia and North Carolina. The James spinymussel is found in waters with slow to moderate current and relatively hard water on sand and mixed sand-gravel substrates that are free from silt.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/14/08).

[USFWS] United States Fish and Wildlife Service. James spinymussel in NC: <http://www.fws.gov/nc-es/mussel/jamesspiny.html> (Accessed 02/14/08)

### **Littlewing pearly mussel**

USFWS optimal survey window: year round

Habitat Description: In North Carolina, the littlewing pearly mussel is known from the Little Tennessee River watershed. It inhabits small to medium-sized streams with low turbidity, cool water, and a high to moderate gradient. This mussel can be

found buried in gravel or beneath boulders and slabrock, or lying on top of the substratum in riffles. It can also be found partly buried or on the surface of the substratum in the transition zone between long pools and riffles. It has been suggested that the best times to find this mussel are in late spring and in the late fall, when they are on top or partly buried in the substratum during spawning.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/14/08).

[NCWRC] North Carolina Wildlife Resources Commission. North Carolina Mussel Atlas: [http://www.ncwildlife.org/pg07\\_WildlifeSpeciesCon/pg7b1a1.htm](http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/pg7b1a1.htm) (Accessed 02/14/08)

### **Tan riffleshell**

USFWS optimal survey window: year round

Habitat Description: Historic occurrences of the Tan riffleshell are known from the French Broad and Hiawassee Rivers in North Carolina. Currently, the only known viable population of this species is located in Tazwell County, Virginia. Individuals are typically found in headwaters, riffles, and shoals in sand and gravel substrates.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/14/08)

[USFWS] United States Fish and Wildlife Service. Tan riffleshell (*Epioblasma florentina walkei*). [http://ecos.fws.gov/docs/life\\_histories/F010.html](http://ecos.fws.gov/docs/life_histories/F010.html). (Accessed 02/14/08)

### **Tar Spinemussel**

USFWS optimal survey window: year round

Habitat Description: The Tar spinemussel is endemic to the Tar and Neuse River drainage basins in North Carolina. This mussel requires a stream with fast flowing, well-oxygenated, circumneutral pH water. The bottom should be composed of unconsolidated gravel and coarse sand. The water needs to be relatively silt-free, and stream banks should be stable, typically with many roots from adjacent riparian trees and shrubs.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/14/08)

[NCWRC] North Carolina Wildlife Resources Commission. North Carolina Mussel Atlas: [http://www.ncwildlife.org/pg07\\_WildlifeSpeciesCon/pg7b1a1.htm](http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/pg7b1a1.htm) (Accessed 02/14/08)

[NCNHP] North Carolina Natural Heritage Program. Tar Spiny mussel: <http://www.ncnhp.org/Images/65.pdf>. (Accessed 02/14/08)

## REPTILES

### American alligator

USFWS optimal survey window: year round (only warm days in winter)

Habitat Description: In North Carolina, alligators have been recorded in nearly every coastal county, and many inland counties to the fall line. The alligator is found rivers, streams, canals, lakes, swamps, and coastal marshes. Adult animals are highly tolerant of salt water, but the young are apparently more sensitive, with salinities greater than 5 parts per thousand considered harmful. The American alligator remains on the protected species list due to its similarity in appearance to the Endangered American crocodile.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/15/08)

[USFWS] United States Fish and Wildlife Service. American alligator (*Alligator mississippiensis*) [http://www.fws.gov/species/species\\_accounts/bio\\_alli.html](http://www.fws.gov/species/species_accounts/bio_alli.html). (Accessed 02/15/08)

[USFWS] United States Fish and Wildlife Service. American alligators in North Carolina. <http://www.fws.gov/nc-es/reptile/alligat.html>. (Accessed 02/15/08)

### Bog turtle

USFWS optimal survey window: April 1 – October 1 (visual surveys); April 1-June 15 (optimal for breeding/nesting); May 1-June 30 (trapping surveys)

Habitat Description: Bog turtle habitat consists of open, groundwater supplied (springfed), graminoid dominated wetlands along riparian corridors or on seepage slopes. These habitats are designated as mountain bogs by the NCNHP, but they are technically poor, moderate, or rich fens that may be associated with wet pastures and old drainage ditches that have saturated muddy substrates with open canopies. Plants found in bog turtle habitat include sedges, rushes, marsh ferns, herbs, shrubs (tag alder, hardhack, blueberry, etc.), and wetland tree species (red

maple and silky willow). These habitats often support sphagnum moss and may contain carnivorous plants (sundews and pitcherplants) and rare orchids. Potential habitats may be found in western Piedmont and Mountain counties from 700 to 4500 feet elevation in North Carolina. Soil types (poorly drained silt loams) from which bog turtle habitats have been found include Arkaqua, Chewacla, Dellwood, Codorus complex, Hatboro, Nikwasi, Potomac – Iotla complex, Reddies, Rosman, Tate – Cullowhee complex, Toxaway, Tuckasegee – Cullasaja complex, Tusquitee, Watauga, and Wehadkee.

**Biological Conclusion:**

Herman, D.W. and B.W. Tryon. 1997. Land use, development, and natural succession and their effects on bog turtle habitat in the southeastern United States. *In* J. Van bbema (ed.), *Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles – An International Conference*, pp. 364-371. July 1993, State University of New York, Purchase. New York Turtle and Tortoise Society, New York.

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/22/08)

[NCWRC] North Carolina Wildlife Resources Commission. Bog Turtle Fact Sheet. 2006. [http://www.ncwildlife.org/pg07\\_wildlifespeciescon/nongame\\_bogturtle\\_lores.pdf](http://www.ncwildlife.org/pg07_wildlifespeciescon/nongame_bogturtle_lores.pdf). (Accessed 02/22/08)

[USFWS] United States Fish and Wildlife Service. Bog Turtles in North Carolina. <http://www.fws.gov/nc-es/reptile/bogtur.html>. (Accessed 02/22/08)

**Green sea turtle**

USFWS optimal survey window: April - August

Habitat Description: The green sea turtle is found in temperate and tropical oceans and seas. Nesting in North America is limited to small communities on the east coast of Florida requiring beaches with minimal disturbances and a sloping platform for nesting (they do not nest in NC). The green sea turtle can be found in shallow waters. They are attracted to lagoons, reefs, bays, mangrove swamps and inlets where an abundance of marine grasses can be found, as this is the principle food source for the green turtle.

**Biological Conclusion:**

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/18/08)

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources. Threats to Marine Turtles. <http://www.nmfs.noaa.gov/pr/species/turtles/threats.htm>. (Accessed 02/18/08)

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources. Green Turtle (*Chelonia mydas*). <http://www.nmfs.noaa.gov/pr/species/turtles/green.htm>. (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Green Sea Turtles in North Carolina. <http://www.fws.gov/nc-es/reptile/greensea.html>. (Accessed on 02/18/08)

### **Hawksbill turtle**

USFWS optimal survey window: April - August

Habitat Description: Hawksbill sea turtles are found in tropical and subtropical oceans.

Sightings have been reported on the east coast of the U.S. as far north as Massachusetts, although rarely north of Florida. Sightings have been recorded from a handful of counties in North Carolina, but the turtle is not known to breed here. Adult hawksbills are found in coastal waters, especially around coral reefs, rocky outcrops, shoals, mangrove bays, and estuaries. Juveniles are often seen offshore, in floating mats of seaweed. This species nests on a wide range of beach types and substrates, using both low- and high-energy beaches on islands and mainland sites. The nest is typically placed near or under vegetation of some sort.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/18/08)

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources.. Hawksbill Turtle (*Eretmochelys imbricata*). <http://www.nmfs.noaa.gov/pr/species/turtles/hawksbill.htm>. (Accessed on 02/18/08)

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources. Threats to Marine Turtles. <http://www.nmfs.noaa.gov/pr/species/turtles/threats.htm>. (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Hawksbill Sea Turtles in North Carolina. <http://www.fws.gov/nc-es/reptile/hawksbill.html>. (Accessed 02/18/07)

### **Kemp's ridley sea turtle**

USFWS optimal survey window: April - August

Habitat Description: Kemp's ridley sea turtle is the smallest of the sea turtles that visit North Carolina's coast, and has been sighted in most coastal counties. While the majority of this sea turtle's nesting occurs in Mexico, the species is known to nest on North Carolina beaches infrequently. Sightings of the species exist for most coastal counties. Kemp's ridley sea turtle can lay eggs as many as three times during the April to June breeding season. Kemp's ridley sea turtles prefer beach sections that are backed up by extensive swamps or large bodies of open water

having seasonal narrow ocean connections and a well defined elevated dune area.  
The species prefers neritic (nearshore) areas with sandy or muddy bottoms.  
Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/21/08)

[NCNHP] North Carolina Natural Heritage Program. *Lepidochelys kempii* - Atlantic Ridley. <http://149.168.1.196/nhp/makeMap.php?sciName=Lepidochelys%20kempii>. (Accessed 02/21/08)

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources. Kemp's Ridley Turtle (*Lepidochelys kempii*). <http://www.nmfs.noaa.gov/pr/species/turtles/kempsridley.htm>. (Accessed on 02/21/08)

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources. Threats to Marine Turtles. <http://www.nmfs.noaa.gov/pr/species/turtles/threats.htm>. (Accessed 02/21/08)

[USFWS] United States Fish and Wildlife Service. Kemp's Ridley Sea Turtles in North Carolina. <http://www.fws.gov/nc-es/reptile/ridley.html>. (Accessed 02/21/08)

### **Leatherback sea turtle**

USFWS optimal survey window: April - August

Habitat Description: Leatherbacks are distributed world-wide in tropical waters of the Atlantic, Pacific, and Indian oceans. They are generally open ocean species, and may be common off the North Carolina coast during certain times of the year. However, in northern waters leatherbacks are reported to enter into bays, estuaries, and other inland bodies of water. Major nesting areas occur mainly in tropical regions. In the United States, primary nesting areas are in Florida, however nests are known from Georgia, South Carolina, and North Carolina as well. Nesting occurs from April to August. Leatherbacks need sandy beaches backed with vegetation in the proximity of deep water and generally with rough seas. Beaches with a relatively steep slope are usually preferred.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/18/08)

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources. Leatherback Turtle (*Dermochelys coriacea*). <http://www.nmfs.noaa.gov/pr/species/turtles/leatherback.htm>. (Accessed on 02/18/08)

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources. Threats to Marine Turtles.  
<http://www.nmfs.noaa.gov/pr/species/turtles/threats.htm>. (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Leatherback Sea Turtles in North Carolina. <http://www.fws.gov/nc-es/reptile/leather.html>. (Accessed 02/18/08)

### **Loggerhead turtle**

USFWS optimal survey window: April - August

Habitat Description: The loggerhead is widely distributed within its range, and is found in three distinct habitats during their lives. These turtles may be found hundreds of miles out in the open ocean, in neritic (nearshore) areas, or on coastal beaches. In North Carolina, this species has been observed in every coastal county. Loggerheads occasionally nest on North Carolina beaches, and are the most common of all the sea turtles that visit the North Carolina coast. They nest nocturnally, at two to three year intervals, between May and September, on isolated beaches that are characterized by fine-grained sediments. In nearshore areas, loggerheads have been observed in bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and shipwrecks are often used as foraging areas.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available  
<http://www.natureserve.org/explorer>. (Accessed 02/18/08)

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources. Threats to Marine Turtles.  
<http://www.nmfs.noaa.gov/pr/species/turtles/threats.htm>. (Accessed 02/18/08)

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources. Loggerhead Turtle (*Caretta caretta*).  
<http://www.nmfs.noaa.gov/pr/species/turtles/loggerhead.htm>. (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Loggerhead Sea Turtles in North Carolina. <http://www.fws.gov/nc-es/reptile/logger.html>. (Accessed 02/18/08)

### **SNAIL**

#### **Noonday globe**

USFWS optimal survey window: April-September (or prior to first fall frost); April-May (optimal)

Habitat Description: The noonday globe is restricted to a small area within the Nantahala gorge in western North Carolina, where it is found in association with high, steep, wet, calcareous cliffs. (Calcium is vital to snails because it is a major component

of their shells.) The forest in this area is mature, with many large trees and a diverse plant community, and a forest floor with a thick, rich humus layer. The biology of this species is largely unknown. During warm months, these snails can be found on wet surface vegetation. In dryer times, the snails often reside under leaf litter. They are active both day and night. It is thought that noonday snails feed on vegetation and fungal mycelia.

#### Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed 02/18/08)

[USFWS] United States Fish and Wildlife Service. Noonday Globe in North Carolina. <http://www.fws.gov/nc-es/snail/noonglobe.html>. (Accessed 02/18/08)

## CRITICAL HABITATS

### Cape Fear shiner

Critical habitat is defined under the Endangered Species Act as the specific areas within the geographical area occupied by a species which have physical or biological features essential to the conservation of the species and that may require special management considerations or protection, or specific areas outside the geographical area occupied by a species but for which those areas are essential for the conservation of the species.

For the Cape Fear Shiner, designated critical habitat areas are defined as:

1. Chatham County, NC. Approximately 4.1 miles of the Rocky River from North Carolina State Highway 902 Bridge downstream to Chatham County Road 1010 Bridge;
2. Chatham and Lee Counties, NC. Approximately 0.5 river mile of Bear Creek, from Chatham County Road 2156 Bridge downstream to the Rocky River, then downstream in the Rocky River (approximately 4.2 river miles) to the Deep River, then downstream in the Deep River (approximately 2.6 river miles) to a point 0.3 river mile below the Moncure, North Carolina, U.S. Geological Survey Gaging Station; and,
3. Randolph and Moore Counties, NC. Approximately 1.5 miles of Fork Creek, from a point 0.1 river mile upstream of Randolph County Road 2873 Bridge downstream to the Deep River then downstream approximately 4.1 river miles of the Deep River in Randolph and Moore Counties, North Carolina, to a point 2.5 river miles below Moore County Road 1456 Bridge.

Primary constituent elements are physical and biological features of the designated critical habitat essential to the conservation of the species. The constituent elements for the Cape Fear shiner include clean streams with gravel, cobble, and boulder substrates

with pools, riffles, shallow runs and slack water areas with large rock outcrops and side channels and pools with water of good quality with relatively low silt loads.

[USFWS] United States Fish and Wildlife Service. Cape Fear shiner (*Notropis mekistocholas*). <http://www.fws.gov/nc-es/fish/cfshiner.html>. (Accessed 02/21/08)

[USFWS] United States Fish and Wildlife Service. 1987. Determination of endangered species status and designation of critical habitat for Cape Fear shiner. Federal Register 52:36034-36039.

### **Spotfin chub (=turquoise shiner)**

Critical habitat is defined under the Endangered Species Act consists of: (1) the specific areas within the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of the ESA, on which are found those physical or biological features (constituent elements) (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of the Act, upon a determination by the Secretary that such areas are “essential for the conservation of the species.”

In North Carolina, Macon and Swain Counties, critical habitat is designated as the Little Tennessee River, main channel from the backwaters of Fontana Lake upstream to the North Carolina-Georgia state line.

[USFWS] United States Fish and Wildlife Service. 1977. Final Threatened Status and Critical Habitat for Five Species of Southeastern Fishes. Federal Register 42:47840-47845.

### **Appalachian elktoe**

Critical habitat is defined under the Endangered Species Act consists of: (1) the specific areas within the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of the ESA, on which are found those physical or biological features (constituent elements) (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of the Act, upon a determination by the Secretary that such areas are “essential for the conservation of the species.”

Critical habitat for the Appalachian elktoe has been designated in 144.3 total river miles (232.2 kilometers) in six distinct units.

1. Encompasses approximately 24 mi (38.5 km) of the main stem of the Little Tennessee River from the Lake Emory Dam in Franklin, Macon County, NC, downstream to the backwaters of Fontana Reservoir in Swain County, NC.

2. Encompasses approximately 26 mi (41.6 km) of the main stem of the Tuckasegee River, from NC State Route 1002 bridge in Cullowhee, Jackson County, NC, downstream to the NC 19 bridge north of Bryson City, Swain County, NC.
3. Encompasses approximately 9.1 mi (14.6 km) of the main stem of the Cheoah River from the Santeelah Dam downstream to its confluence with the Little Tennessee River, in Graham County, NC.
4. Encompasses approximately 4.7 mi (7.5 km) of the main stem of the Little River (French Broad River Basin) from the Cascade Lake Power Plant, downstream to its confluence with the French Broad River in Transylvania County, NC.
5. Encompasses approximately 11.1 mi (17.8 km) of the main stem of the West Fork Pigeon River (French Broad River Basin) from the confluence with the Little East Fork Pigeon River downstream to the confluence with the East Fork Pigeon River, and the main stem of the Pigeon River from the confluence of the East Fork Pigeon River and West Fork Pigeon River downstream to the NC 215 crossing, south of Canton, Haywood County, NC.
6. Encompasses approximately 3.7 mi (5.9 km) of the main stem of the North Toe River, Yancey and Mitchell counties, NC, from the confluence with Big Crabtree Creek, downstream to the confluence of the South Toe River; approximately 14.1 mi (22.6 km) of the main stem of the South Toe River, Yancey County, NC, from the NC State Route 1152 crossing, downstream to its confluence with the North Toe River; approximately 21.6 mi (34.6 km) of the main stem of the Toe River, Yancey and Mitchell counties, NC, from the confluence of the North Toe River and South Toe River, downstream to the confluence of the Cane River; approximately 16.5 mi (26.4 km) of the main stem of the Cane River, Yancey County, NC, from the NC State Route 1381 crossing, downstream to its confluence with the Toe river; and approximately 13.5 mi (21.6 km) of the main stem of the Nolichucky River from the confluence of the Toe River and the Cane River in Yancey County and Mitchell County, NC downstream to the US 23/19W crossing, southwest of Erwin, Unicoi County, TN. Unit 6 is depicted in relation to the project area(s) in Figure 2.

When designating Critical Habitat, the USFWS identifies physical and biological features (primary constituent elements) that are essential to the conservation of the species and that may require special management considerations or protection. The primary constituent elements essential for the conservation of the Appalachian elktoe are:

1. Permanent, flowing, cool, clean water;
2. Geomorphically stable stream channels and banks;
3. Pool, riffle, and run sequences within the channel;
4. Stable sand, gravel, cobble, and boulder or bedrock substrates with no more than low amounts of fine sediment;
5. Moderate to high stream gradient;
6. Periodic natural flooding; and
7. Fish hosts, with adequate living, foraging, and spawning areas for them.

Although there are specific sites within the six units that do not contain all of the primary constituent elements, these elements are found consistently throughout the designated

river reaches and are present at the sites containing the “healthiest” of the occurrences (USFWS 2002).

[USFWS] United States Fish and Wildlife Service. 2002. Designating Critical Habitat for the Appalachian Elktoe. Federal Register 67:61016-61040.

### **Spruce-fir moss spider**

Critical habitat is defined under the Endangered Species Act consists of: (1) the specific areas within the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of the ESA, on which are found those physical or biological features (constituent elements) (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of the Act, upon a determination by the Secretary that such areas are “essential for the conservation of the species.”

The critical habitat for this species is defined as all portions of the Pisgah National Forest in North Carolina and the Cherokee National Forest in Tennessee, bounded to the north and to the south of the North Carolina/Tennessee state line by the 1,646-m (5,400-ft) contour, from the intersection of the 1,646-m (5,400-ft) contour with the State line north of Elk Hollow Branch, Avery County, North Carolina, and southwest of Yellow Mountain, Carter County, Tennessee, west to the 1,646-m (5,400-ft) contour at Eagle Cliff, Mitchell County, North Carolina. The critical habitat designation in the federal register gives more specific information on the boundaries of the critical habitat.

Within these areas, the primary constituent elements include (1) Fraser fir or fir-dominated spruce-fir forests at and above 1,646-m (5,400-m) in elevation, and (2) moderately thick and humid, but not wet, moss (species in the genus *Dicranodontium*, and possibly *Polytrichum*) and/or liverwort mats on rock surfaces that are adequately sheltered from the sun and rain (by overhang and aspect) and include a thin layer of humid soil and/or humus between the moss and rock surface.

[USFWS] United States Fish and Wildlife Service. 2001. Designation of Critical Habitat for the Spruce-fir Moss Spider. Federal Register 66 FR 35547 35566

### **Piping plover**

*There are too many individual units of critical habitat designated by USFWS to list here. See the Federal Register (cited below) for a description of each designated unit. Note: Units 1, 2, 4, and 5 (including portions of Dare and Hyde Counties) of the designated Critical Habitat were vacated by court order and remanded to the USFWS. Thus, these units no longer exist. You will need to tailor your critical habitat description for this species to the unit(s) closest to your project.*

Primary constituent elements of wintering piping plover habitat include sand and/or mud flats with no or very sparse emergent vegetation. In some cases, these flats may be covered or partially covered by a mat of blue-green algae. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also essential, especially for roosting piping plovers. Such sites may have debris, detritus (decaying organic matter), or micro-topographic relief (less than 50 cm above substrate surface) offering refuge from high winds and cold weather. Essential components of the beach/dune ecosystem include surf-cast algae for feeding of prey, sparsely vegetated backbeach (beach area above mean high tide seaward of the dune line, or in cases where no dunes exist, seaward of a delineating feature such as a vegetation line, structure, or road) for roosting and refuge during storms, spits (a small point of land, especially sand, running into water) for feeding and roosting, salterns (bare sand flats in the center of mangrove ecosystems that are found above mean high water and are only irregularly flushed with sea water) and washover areas for feeding and roosting. Washover areas are broad, unvegetated zones with little or no topographic relief that are formed and maintained by the action of hurricanes, storm surge, or other extreme wave action. Several of these components (sparse vegetation, little or no topographic relief) are mimicked in artificial habitat types used less commonly by piping plovers, but that are considered critical habitat (e.g., dredge spoil sites).

[USFWS] United States Fish and Wildlife Service. 2001. Final Determination of Critical Habitat for Wintering Piping Plovers. Federal Register 66 FR 36038 36136.